Testimony of the

American Wind Energy Association

before the

House Resources Committee
Subcommittee on Energy and Mineral Resources

July 15, 2004 Hearing on
Advances in Technology: Innovations in the
Domestic Energy and Mineral Sector

The Honorable Barbara Cubin, Chair

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Madame Chairman, members of the Subcommittee, my name is Sam Enfield. I am Vice President of Development for Atlantic Renewable Energy Corporation (AREC). AREC is a wind energy development firm active in the Mid-Atlantic region and in New York State. During the past four years, Atlantic Renewable has developed approximately 160 megawatts (MW) of successfully operating wind generating capacity in these areas.

I also serve as President of the American Wind Energy Association, a trade association with more than 650 members involved in every aspect of the wind power industry. Companies represented by AWEA include GE Wind, FPL Energy, American Electric Power and Vestas American Wind Technology.

Wind Power is a Reality Today

My general purpose today, in keeping with the theme of this proceeding, is to discuss improvements in wind generation technology, and the increased cost-effectiveness the industry has achieved since its inception in the early 1980s. But first I would like state clearly that the federal commitment to wind power generation - both past and present - has made possible the initiation and development of what has been the fastest-growing energy industry in the world over the past decade or more. Most recently, more than 2,000 megawatts (MW) of wind generation – producing enough electricity to serve more than 600,000 average American homes – have been installed in the United States in the past two years alone. More than 6000 MW of wind are operating in the United States currently, generating enough power to meet the annual needs of 1.6 million average homes.

With continued government encouragement to accelerate its further development, this increasingly competitive source of energy can provide as much as six percent of the nation's electricity by 2020. In so doing, it can help revitalize rural communities and provide valuable domestic manufacturing, engineering, and operations jobs. Particularly with respect to wind power's ability to create important manufacturing jobs, the continuance over as long a period as possible of the now-lapsed federal wind energy production tax credit (PTC) is critically important. The lapse in this important incentive at the end of 2003 has stymied more than $2 billion of capital investment and caused the loss of thousands of jobs. This is particularly unfortunate, given that the PTC enjoys bipartisan support in both houses of Congress and within the Bush Administration.

Wind Power Cost Reductions

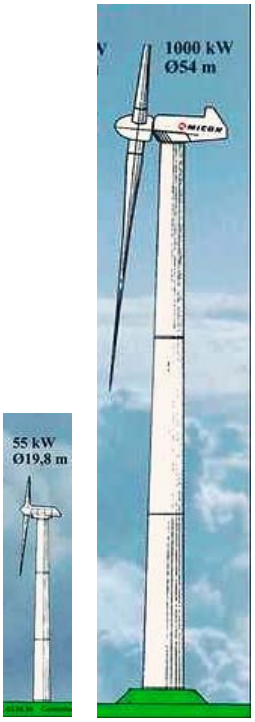
The tax credit, along with the more than 80 percent reduction in wind power costs achieved since the 1980's, has positioned wind to assume a meaningful role in this nation's energy supply mix. While many in the electricity industry are still unfamiliar with how readily and cost-effectively wind - even with its intermittent nature - can be integrated into the electric supply mix, wind, with the production tax credit, is increasingly competitive on price. Thus it is an increasingly viable option for use in diversifying generation portfolios.

Two principal factors have been at work in reducing wind power's cost of energy – increased turbine efficiency and increased turbine reliability. The most visible – literally – of these factors is turbine size. As the graphic below indicates, wind turbines have increased in scale significantly over the industry's twenty-year history. While turbines used in the first California projects during the 1980s had rotors in the range of 30 feet in diameter, turbines used today have rotors more than 70 ***meter****s* – 230 feet – in diameter. Early turbines were mounted on towers in the range of 50 to 60 feet in height. Today's turbines reach the higher wind speeds further aloft mounted on towers that are 70 to 80 meters – 230 to 260 feet – in height.

Advanced Technology and Economies of Scale Drive Down Cost

	1981	**2000**
Rated Capacity	25 kW	1,650 kW
Rotor Diameter	10 meters	71 meters
Total Cost ($000)	$65	$1,300
Cost Per kW	$2,600	$790
Output, MWh/year	45	5,600

120 x the energy at 20 x the cost!



Source: American Wind Energy Association

The other, less visible factor in wind power's improved economics is the high reliability demonstrated by contemporary wind turbines – actually demonstrated by wind turbines consistently over the past decade. Availability of wind turbines, the percentage of time that a turbine is available to operate, consistently runs in the very high ninety-percent range, and has since the mid-1990s.

As a result of this progress, power generated by utility-scale wind projects can deliver power – with the help of the PTC – for prices ranging from 2.5 to 5.5 cents per kilowatt-hour. The

quality of the wind resource is obviously the critical factor influencing price. But project size, site characteristics, and requirements for interconnecting with the transmission grid are important factors as well.

Technology Development

While the basic configuration of wind turbines is unchanged from that of many of the first-generation units – a 3-bladed rotor mounted on the upwind side of the tower, actively turned into the wind by on-board controllers – there have been a host of technological advances that have contributed to the increased effectiveness of today's machines. These include:

- Enhanced airfoils, to maximize the efficiency with which the blades capture energy
- Advanced controllers, allowing more independent operation of the turbines
- Advanced power electronics, for more efficient generation and better interface with the electric grid

In relation to the last item, a great deal of effort is being devoted to building into wind power systems the capability to interface with the grid in a manner fully consistent with those demonstrated by other major electric generation technologies. Despite the intermittent nature of wind, wind projects are able to assist grid operators in maintaining desired voltage levels. They are able to "ride through" voltage drops on the grid, remaining available to supply power. By the same token, wind projects have the capability to curtail output, when that is needed by the grid operator. And the industry is refining its forecasting skills in order to reduce the uncertainty associated with wind output in hour-ahead and day-ahead power markets. With respect to this set of issues, the industry has responded to an invitation from the Federal Energy Regulatory Commission by providing a set of specific proposed interconnection standards applicable to utility-scale wind power projects.

Wind Power as Economic Stimulus

Perhaps not surprisingly, some of the strongest supporters of wind power are the owners of the land on which turbines are sited. Payments to landowners are typically structured as royalties, based on revenue generated by turbines sited on their land. Depending on its productivity and the price at which its output is sold, one of today's turbines can generate several thousand dollars each year in royalty payments, while occupying only about one acre of land. For many living in the rural areas where wind projects are usually located, receiving royalties from even a few turbines can mean being able to stay on the land itself. In addition, wind projects employ technicians and clerical personnel for their operations – about one technician for every 10 turbines, in general. These are good paying jobs, but can be filled by people with basic mechanical and electrical skills. And, as the industry is growing and there are not surplus "windsmiths" to go around, new projects generally fill their employment needs locally,

While the industry got its start in California, it is now truly national. There are projects using modern wind turbines in more than half the states[1], and twelve states have more than 100 MW of installed wind capacity. Turbine and component manufacturers are now located across the nation as well.

Conclusion

Madame Chairman, I very much appreciate the opportunity to update the Subcommittee on the status of what we in the wind industry feel is a great success story – the development over a brief 20-year period of a rapidly maturing, increasingly competitive, and environmentally friendly source of electric power. It is one in which all states can participate, directly or indirectly. And it is one which can – and is – providing economic benefits in areas where they are badly needed. Thank you very much for your interest.

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